

# Assessment of Representativeness of IPD Surveillance Conducted by the National Microbiology Laboratory of Canada

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## Background and Objectives

- Invasive pneumococcal disease (IPD) is an acute and serious illness caused by *Streptococcus pneumoniae*. Understanding the evolving epidemiology of *S pneumoniae* serotypes (STs) is important for assessing the current and planning potential future immunization programs with higher valency pneumococcal vaccines.
- In Canada, IPD is mandatory reportable to provincial/territorial public health.
  - Provinces and territories voluntarily submit annual IPD data to the Canadian Notifiable Disease Surveillance System (CNDSS), which publishes information on IPD cases and incidence rates, stratified by age group, gender and year, however serotype specific data are not available<sup>1,2</sup>.
  - Some provinces also make their IPD surveillance data publicly available, however these reports may lack ST specific data.
- Provinces/territories also voluntarily submit IPD isolates to the National Microbiology Laboratory (NML) for serotype determination; provinces that conduct their own serotyping submit this information. The NML produces comprehensive annual IPD surveillance report<sup>3</sup> including serotype distribution (stratified by age group), limited clinical data and antimicrobial susceptibility testing of IPD cases. However, due to lack of population denominator, no ST specific incidence rates are available<sup>3</sup>.
- The national/provincial reportable IPD surveillance programs and NML IPD surveillance programs are not linked.
- The objective of the study is to assess the representativeness of the NML surveillance as compared to the national (CNDSS) and provincial reportable diseases databases.

## Methods

- Over the study time period (2010-2017), we compared IPD case counts between the CNDSS and NML reports.
  - As a nationally notifiable disease, IPD cases have been reported by all Canadian provinces and territories through the national surveillance systems CNDSS since 2001. The annual IPD cases and incidence rates are available online<sup>1</sup>.
  - National Microbiology Laboratory (NML) has been offering surveillance, reference diagnostics and outbreak support on invasive *S. pneumoniae* since April 2010<sup>3</sup>.
  - The annual NML report presents the serotype distribution of IPD isolates that are forwarded from Canadian provincial and territorial public health laboratories, regional health units and reference centres to the NML. The aggregated counts also include serotype data submitted by Laboratoire de santé publique du Québec, Toronto Invasive Bacterial Diseases Network, and the Alberta Provincial Laboratory, organizations that perform their own serotyping<sup>3</sup>.
  - Due to the difference in age grouping between CNDSS and NML, comparison was limited to these groups: all age, <5, 5-14 and >15 years of age.
  - In order to accommodate the periodic updates of the historical surveillance data, more recent NML reports were preferentially used when possible. NML report 2017<sup>3</sup> was used for 2013-2017, NML report 2015<sup>4</sup> for 2011-2012 and NML report 2014<sup>5</sup> for 2010.
- We also compared the province specific all age IPD counts from NML to notifiable disease data from four provinces; British Columbia (BC)<sup>6</sup>, Alberta (AB)<sup>7</sup>, Ontario (ON)<sup>8</sup> and Quebec (QC)<sup>9</sup>.

## Results

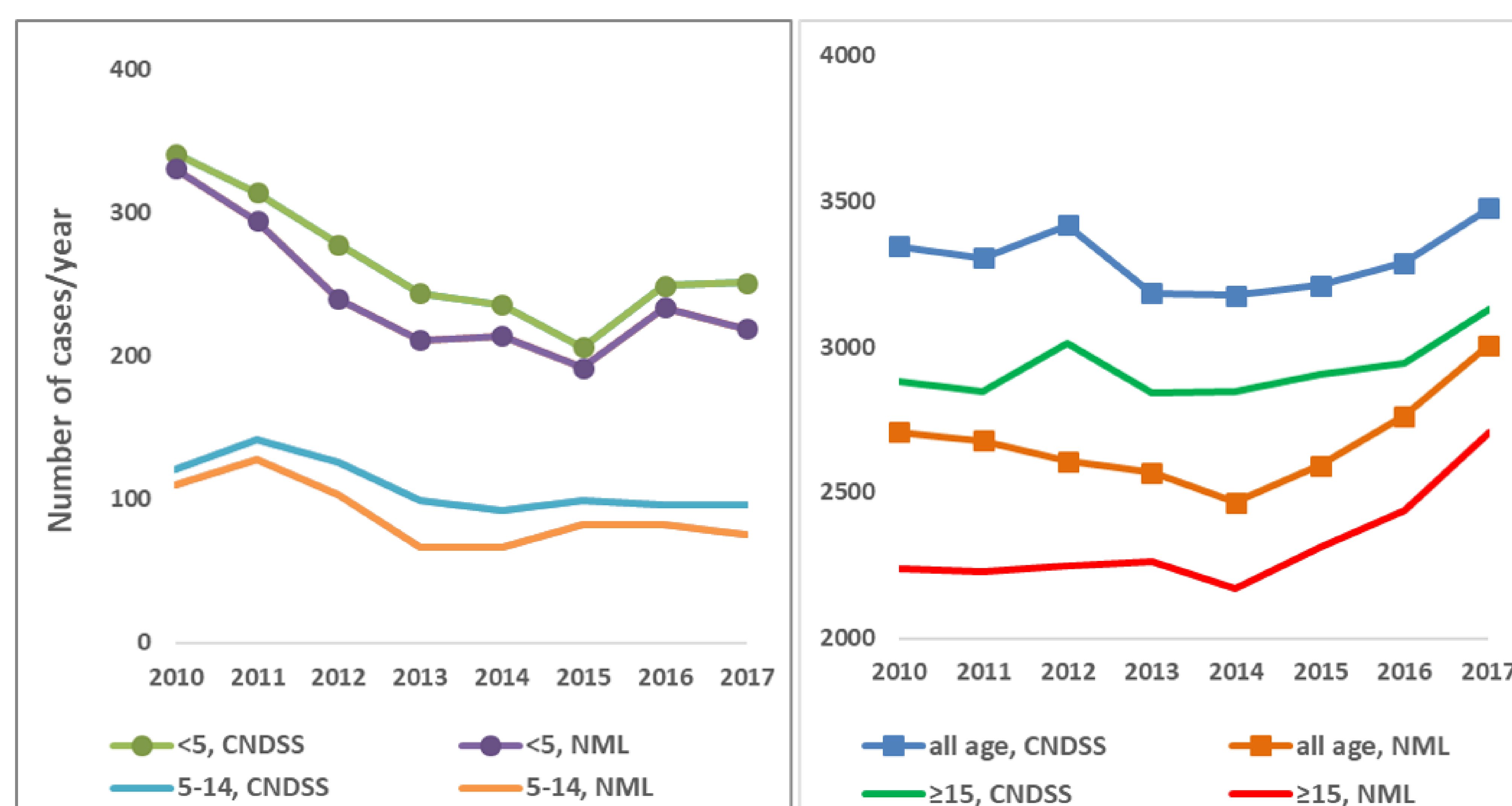


Figure 1: Comparison of age stratified IPD case counts between CNDSS and NML

- On average, NML (mean n=2674) reported 19% less cases annually compared to CNDSS (mean n=3301), between 2010 and 2017.
- For <5 group, NML reported 91% (range 86-97%) of CNDSS case count whereas for 5-14 and >15 years of age, it was 81% (range 68%-91%) and 79% (range 75-86%), respectively.
- Although NML showed trends similar to CNDSS over the years, different levels of concordance were seen across different age groups (Figure 1).

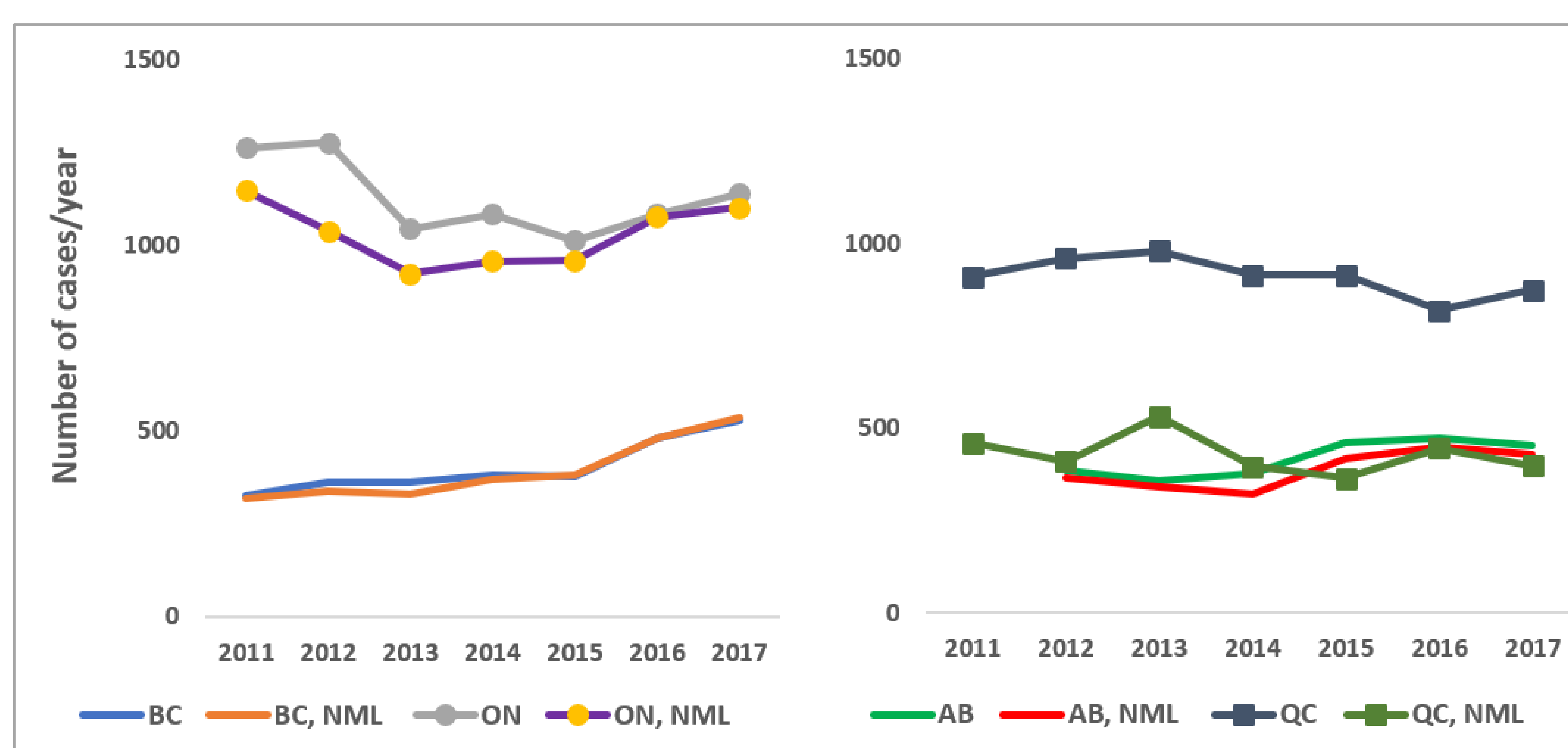


Figure 2. Comparison of all age IPD case counts between NML and provincial databases

- Compared to the corresponding provincial databases, NML reported 91%, 97%, and 93% case counts for ON, BC, and AB, respectively, while it was only 47% for Quebec.
- In general, BC and AB showed very high level of concordance (>90%) for the study period while the concordance improved for ON since 2015 (Figure 2).
- Further analysis (data not shown) revealed that NML has been consistently reporting >96% of Quebec <5 IPD case counts, indicating that the large discrepancy is the result of under-representation of >5 populations.

## Discussion/Conclusions

- Since CNDSS does not provide serotype specific data, NML surveillance has been instrumental to gain insight into the evolving epidemiology of *S. pneumoniae* serotypes in Canada although it lacks ST specific incidence rates.
- However, upon comparisons of IPD counts from NML surveillance reports with national and provincial reportable disease databases, we found NML mainly underreports data for individuals over 5 years of age and that different levels of concordance exist across provinces and age groups.
- The limitations of NML surveillance including incomplete or inconsistent reporting should be taken into consideration when interpreting the data.

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